N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

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Research Design

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Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

Causality
A ➔ B
Pressure ➔ Ulcer

Multicausality
Years smoking ➔ Heart disease
High fat diet ➔ Heart disease
Limited exercise ➔ Heart disease
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

- Measure of accuracy of a study

- Examined with critique of the following dimensions:
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

• Controlling the environment of the study setting

• Levels of controlling:
  o Natural setting
  o Partially controlled setting: e.g., clinics
  o Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- **Controlling the treatment**
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- Controlling extraneous variables
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

- Is there a treatment?
  - Yes
  - No
    - Is the primary purpose examination of relationships?
      - No
      - Yes
        - Descriptive Design
        - Quasi-Experimental Study
          - Will a randomly assigned control group be used?
            - Yes
            - No
              - Is the original sample randomly selected?
                - Yes
                - No
                  - Experimental Study
        - Correlational Design
Selecting a Descriptive Design

Examining sequences across time?

- No
  - One Group?
    - No
      - Comparative Descriptive Design
    - Yes
      - Data collected across time
    - Yes
      - Following same subjects across time?
        - No
          - Cross-sectional design
        - Yes
          - Studying events partitioned across time?
            - No
              - Trend Analysis
            - Yes
              - Repeated measures of each subject

- Yes
  - Single unit of study
    - No
      - Longitudinal Study
    - Yes
      - Case Study
A Typical Descriptive Design

Clarification → Measurement → Description → Interpretation

Variable 1 → Description of Variable 1
Variable 2 → Description of Variable 2
Variable 3 → Description of Variable 3
Variable 4 → Description of Variable 4

Interpretation of Meaning
Development of Hypotheses
A Comparative Descriptive Design

Group I
{variables measured}

Group II
{variables measured}

Describe

Comparison of Groups on Selected Variables

Interpretation of Meaning

Development of Hypotheses
Selecting the Type of Correlational Design

Describe relationships between/among variables?
- Descriptive correlational design

Predict relationships between/among variables?
- Predictive correlational design

Test theoretically proposed Relationships?
- Model testing design
A Descriptive Correlational Design

Measurment

Research Variable 1

Description of variable

Examination of Relationship

Interpretation of Meaning

Description of variable

Research Variable 2

Development of Hypotheses
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

Control Group?
- No
  - Pretest?
    - No
      - One-group post-test only design
    - Yes
      - Repeated Measures?
        - No
          - Strategy for Comparison
            - No
              - Suggest Reevaluating design
              - One group pretest/post-test design
            - Yes
              - Compare treatment & control conditions?
        - Yes
          - Pretest?
            - No
              - One-group post-test only design
            - Yes
              - Repeated Measures?
Selecting The Type of Experimental Design

- **Pretest**
  - No
    - Post-test only control group design
  - Yes
    - Repeated Measurements?
      - No
        - Examine effects of confounding variables?
          - No
            - Multiple sites?
              - Pretest/post-test control group design
            - Yes
              - Randomized clinical trials
                - No
                  - Comparison of multiple levels of treatment
                    - No
                      - Examination of complex relationships among variables in relation to treatment
                    - Yes
                      - Nested Designs
                - Yes
                  - Randomized Block Design
          - Yes
            - Blocking?
              - No
                - Randomized clinical trials
              - Yes
                - Randomized Block Design
# Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Measurement of dependent variables</th>
<th>Manipulation of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td><strong>PRETEST</strong></td>
<td><strong>TREATMENT</strong></td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td><strong>PRETEST</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment:</th>
<th>Under control of researcher</th>
</tr>
</thead>
</table>
| Findings:  | Comparison of pretest and post-test scores  
Comparison of experimental and control groups  
Comparison of pretest-post-test differences between samples |
Uncontrolled threats to validity:  
Testing  
Instrumentation  |
|            | Mortality  
Restricted generalizability as control increases |
Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Measurement of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>TREATMENT</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

- **Treatment:** Under control of researcher
- **Findings:** Comparison of experimental and control groups
- **Uncontrolled threats to validity:** Instrumentation, Mortality, Limited generalizability as control increases
### Nested Design

<table>
<thead>
<tr>
<th>Pain Control Management</th>
<th>Primary Nursing Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional care</td>
<td>Unit A</td>
</tr>
<tr>
<td>PRN Medication</td>
<td></td>
</tr>
<tr>
<td>New approach: “Around the clock” medication</td>
<td>Unit E</td>
</tr>
</tbody>
</table>

**Primary Care**

- Unit A
- Unit B
- Unit C
- Unit D

**No Primary Care**

- Unit E
- Unit F
- Unit G
- Unit H
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically

- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design